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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/693,418	10/20/2000	Brian M Burmaster	ENV 9851.1	1265

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SENNIGER POWERS LEAVITT AND ROEDEL
ONE METROPOLITAN SQUARE
16TH FLOOR
ST LOUIS, MO 63102

EXAMINER

VANOY, TIMOTHY C

ART UNIT	PAPER NUMBER
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1754

DATE MAILED: 03/27/2002

8

Please find below and/or attached an Office communication concerning this application or proceeding.

49-18

Office Action Summary	Application No. 09/693,418	Applicant(s) BURMASTER ET AL.	
	Examiner Timothy C. Vanoy	Art Unit 1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status APPLICANTS ARE GIVEN A TIME LIMIT OF 1 MONTH TO CORRECT THE I.D.S.

- 1) ☐ Responsive to communication(s) filed on _____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 26-30 and 33-42 is/are allowed.
- 6) ☒ Claim(s) 1-25, 31 and 32 is/are rejected.
- 7) ☒ Claim(s) 1, 13 and 26 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 October 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>4, 5, 6</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement date-stamped Feb. 13, 2001 (paper no. 4)

N does not fully comply with the requirements of 37 CFR 1.98 because the literature reference by Lewis G. Harruff (cite no. 18) has not been provided with a publication date and the literature reference "Claus Sulfur Recovery Process" (cite no. 22) has not been provided with either an author or a publication date, as required by 37 C.F.R. 1.98(b)(5). Since the submission appears to be *bona fide*, the Applicants are given **ONE (1) MONTH** from the date of this notice to supply the above mentioned omissions or corrections in the information disclosure statement. **NO EXTENSION OF THIS TIME LIMIT MAY BE GRANTED UNDER EITHER 37 CFR 1.136(a) OR (b).** Failure to timely comply with this notice will result in the above mentioned information disclosure statement being placed in the application file with the noncomplying information **not** being considered. See 37 CFR 1.97(i).

Drawings

modify a) Fig. 1 is objected to as failing to comply with 37 CFR 1.84(p)(4) because the reference character "39" has been used to designate both the line feeding into "gas mixer" 23 and the "incinerator". A proposed drawing correction or corrected drawing is required in reply to the Office Action to avoid abandonment of the application. The objection to the drawing will not be held in abeyance.

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Claim Objections

- Ma*) In claim 1 ln. 26, "absorbent" is misspelled.
- re* b) In claim 13 ln. 3, "and" should be replaced with a comma.
- ove*) In claim 26 ln. 4, "and" should be replaced with a comma.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

The person having "ordinary skill in the art" has the capability of understanding the scientific and engineering principles applicable to the claimed invention. The references of record in this application reasonably reflect this level of skill.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

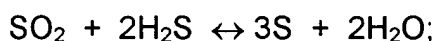
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were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-25, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over the description of the Claus process set forth on pgs. 420 and 451 to 462 in the Gas Purification text by Kohl et al. in view of U. S. Pat. 5,851,265 to Burmaster et al.

Fig. 8-16 on pg. 458 in the Gas Purification book illustrates a Claus process plant for converting hydrogen sulfide into elemental sulfur, comprising:

passing a hydrogen sulfide and sulfur dioxide-containing gas through a catalytic stage, where the hydrogen sulfide and sulfur dioxide react to form elemental sulfur according to:



passing the elemental sulfur-containing gas through a condenser where the gas is cooled to a temperature low enough to condense and collect the elemental sulfur out of the gas, thereby forming a tail gas;

passing the tail gas through an incinerator where it is combusted with air and fuel to (evidently) oxidize any residual sulfur species in the tail gas into sulfur dioxide, thereby forming an incinerator off-gas containing sulfur dioxide.

The difference between the Applicants' claims and the Gas Purification book is that Applicants' claim 1 comprises the further steps of contacting the incinerator off-gas with an absorption liquid in an absorption zone so that the sulfur dioxide is transferred from the incinerator off-gas into the absorption liquid, etc (please see Applicants' claim 1 lines 18 et seq).

U. S. Pat. 5,851,265 describes the same process for treating the off-gas from an incinerator in a Claus plant (please see col. 5 Ins. 48-52) by passing the off-gas into a sulfur dioxide absorber (11) where the sulfur dioxide is sorbed out of the off-gas and into the absorption liquid, thereby producing cleaned gas (which is discharged from the sulfur dioxide absorber (11)) and a sulfur dioxide-loaded absorption liquid (16) which is passed through a sulfur dioxide stripper (22) where the sulfur dioxide is transferred from the absorption liquid into a stripping gas (26) (please see col. 6 ln. 19 to col. 8 ln. 12 and Fig. 3).

The regenerated absorption liquid is recycled back to the sulfur dioxide absorber (11) via line (14) (please see col. 7 Ins. 59-66), while the sulfur dioxide-containing stripper gas may be fed into a Claus plant for recovery of elemental sulfur (please see col. 9 Ins. 45-47).

It would have been obvious to one of ordinary skill in the art at the time the invention was made *to modify* the Claus process illustrated in Fig. 8-18 on pg. 458 in the Gas Purification book *by feeding* the sulfur dioxide-containing incinerator off-gas to the sulfur dioxide absorber (11) in U. S. Pat. 5,851,265 and processing this incinerator off-gas according to the process described in col. 6 ln. 19 to col. 8 ln. 12 in U. S. Pat.

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5,851,265 (instead of passing the incinerator off-gas through the "stack" illustrated in Fig. 8-16 on pg. 458 in the Gas Purification book), in the manner required by at least Applicants' claim 1, *because* of the expected advantage of recovering the sulfur dioxide within the incinerator off-gas in the form of elemental sulfur via treatment in the Claus plant mentioned in col. 9 Ins. 45-47 in U. S. Pat. 5,851,265 rather than wasting the sulfur dioxide within the incinerator off-gas by simply allowing it to be discharged out of the stack, as illustrated in Fig. 8-16 in the Gas Purification book.

It is also submitted to have been obvious to one of ordinary skill in the art at the time the invention was made *to feed* the sulfur dioxide-containing stripper gas of U. S. Pat. 5,851,265 *back to the* "catalytic stage" illustrated in Fig. 8-16 on pg. 458 in the Gas Purification book in the portion of the "Claus process" mentioned in col. 9 ln. 47 in U. S. Pat. 5,851,265, in the manner called for in Applicants' claim 1 Ins. 31 et seq., *because* that is where the sulfur dioxide reacts with the hydrogen sulfide to produce the elemental sulfur, and there is no need to pass it through a burner (since the sulfur species are already in the form of sulfur dioxide) and there is no need to discharge it through the stack (since that would only pollute the atmosphere and waste the sulfur values in the stripper off-gas).

The limitation set forth in Applicants' claim 1 Ins. 6 and 7 calling for the use of a single Claus catalytic reactor is noted, and it is conceded that Fig. 8-16 in the Gas Purification book illustrates the use of two catalytic reactors, however it is submitted that this difference would have been obvious to one of ordinary skill in the art at the time the invention was made, namely to modify the Claus process illustrated in Fig. 8-16 in the

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Gas Purification book by using a single catalytic reactor rather than two catalytic reactors, because the courts have already determined that such elimination of an element from the prior art, along with the concomitant loss of function, is *prima facie* obvious: please see the discussion of the court decisions set forth in section 2144.04(II)(A) in the MPEP (8th ed.) for further details.

The limitation set forth in Applicants' claim 1 Ins. 35 et seq. describing the effect that the recycled sulfur dioxide-containing stripper gas has on the temperature in the catalytic reactor is noted, but such description of the advantages of doing what is obvious from the prior art is *prima facie* obvious: please see the discussion of the court decisions set forth in section 2145(II) in the MPEP (8th ed.) for further details.

Note that pg. 456 Ins. 1-4 in the Gas Purification book reports that the temperatures that the catalytic stages operate at are between the sulfur dew point of the gas and 700 °F (371 °C), which render obvious the temperature limitations of Applicants' claims 2-5 and 7, and also note that pg. 457, 2nd full paragraph in the Gas Purification book reports that alumina may be used as the catalyst, as set forth in Applicants' claim 3. Due to the exothermic nature of the Claus reaction (please note the reaction associated with the "catalytic stages" illustrated in Fig. 8-16 on pg. 458 in the Gas Purification book), it would also be expected that temperature of the catalysts, per se, would be somewhat higher than the 700 °F upper limit mentioned on pg. 456 Ins. 1-4 in the Gas Purification book – in a manner rendering obvious the limitations of Applicants' claim 6.

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Note that pg. 451, last four lines in the Gas Purification book reports that the Claus process can treat pure gaseous hydrogen sulfide or acid gas streams containing hydrogen sulfide in high concentrations, in a manner that is not seen to be unobviously distinct from the limitations of Applicants' claims 8-11, and also note that the paragraph bridging pgs. 451 and 454 in the Gas Purification book reports that the hydrogen sulfide containing gas may be derived from acid gases stripped from alkaline solutions or physical solvents used for the purification of sour gases (natural gas is mentioned on pg. 420 in the Gas Purification book), in a manner rendering obvious the limitations of Applicants' claims 12 and 13.

Note that col. 10 Ins. 28-30 in U. S. Pat. 5,851,265 reports that the stripper gas may have a strength of 20 to 95% by volume, in a manner rendering obvious the limitations of Applicants' claims 14 and 15.

Note that col. 8 Ins. 56-58 in U. S. Pat. 5,851,265 reports that the preferred operating pressures in the stripper range from 20 to 150 kPas., in a manner rendering obvious the limitations of Applicants' claim 16.

Note that the last three lines at the bottom of pg. 461 in the Gas Purification book reports that the $\text{H}_2\text{S}:\text{SO}_2$ mole ratio should be 2:1 and that this ratio is expected to be higher when the sulfur dioxide-containing stripper gas of U. S. Pat. 5,851,265 is mixed in with the feed gas entering the catalytic stage – in a manner rendering obvious the limitations of Applicants' claim 17, and also note that the comment set forth in the sentence bridging pgs. 461 and 462 in the Gas Purification book reports that appreciable deviation from the $\text{H}_2\text{S}:\text{SO}_2$ mole ratio from the 2:1 mole ratio leads to

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drastic reduction in conversion efficiency, in a manner rendering obvious the limitations of Applicants' claim 18.

Note that col. 5 lns. 58-61 in U. S. Pat. 5,851,265 reports that the "source gas", which may originate from the incinerator of a Claus plant, may contain from 0.1 to 5 volume percent sulfur dioxide, in a manner rendering obvious the limitations of Applicants' claim 20.

Note that col. 5 lns. 20-21 and the "Example" set forth in col. 12 in U. S. Pat. 5,851,265 reports the use of dibutyl butyl phosphonate (in its discussion of the liquid solvents set forth in col. 4 lns. 30 et seq.), in a manner that is submitted to meet the limitations of Applicants' claims 19, 21, 22 and 23. Also note that the discussion of prior art organic solvents set forth in col. 2 lns. 2-4 in U. S. Pat. 5,851,265 renders obvious the tetraethylene glycol dimethyl ether mentioned in Applicants' claims 24 and 25.

Note that as the sulfur dioxide-containing stripper gas of U. S. Pat. 5,851,265 is recycled to the gas entering the Claus catalytic stage illustrated in Fig. 8-16 on pg. 458 in the Gas Purification text operating at the temperatures ranging from the dew point of sulfur to 700 °F (371 °C): please see lns. 1-4 on pg. 456 in the Gas Purification book, the same oxidation of the same soot deposited on the same catalyst is expected to inherently occur (consistent with the disclosure set forth on pg. 463, 1st and 2nd full paragraphs in the Gas Purification book), rendering obvious the limitations of Applicants' claims 31 and 32.

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Claims 26-30 and 33-42 have not been rejected under either 35 USC 102 or 35 USC 103 because these claims require pre-washing the feed gas with an aqueous **acid** solution (such as aqueous sulfuric acid: please see claim 27), which is not taught or suggested by any of the references of record.

The following references are made of record:

EP 0 252 497 A2 disclosing a process for recovering sulfur in an oxygen-enriched Claus process, and

EP 0 140 573 A2 disclosing sulfur recovery from ammonia containing as streams.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy C. Vanoy whose telephone number is 703-308-2540. The examiner can normally be reached on 8 hr. days.

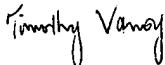
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffen can be reached on 703-308-1164. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

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Timothy Vanoy/tv	 Timothy Vanoy
March 22, 2002	Patent Examiner

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